

Supplemental Preliminary Amendment

Further to the Preliminary Amendment filed on March 18, 2002, and prior to further examination of the above-identified patent application, please enter the following amendments.

IN THE CLAIMS:

Please CANCEL claims 1, 4-7, 9, 11, 12, and 14-24 without prejudice to or disclaimer of the recited subject matter.

Please ADD claims 47-67 as follows. For the Examiner's convenience, all claims currently pending in this application have been reproduced below:

25. An exposure apparatus comprising:
an optical system including an optical element having at least one aperture through which a gas can be transmitted.

26. An apparatus according to Claim 25, further comprising a plurality of optical components each having at least one aperture, wherein a straight line connecting apertures of adjacent optical elements is not parallel to any of optical axes of the adjacent optical elements and the straight line also does not intersect any of the optical axes of the adjacent optical elements.

27. An apparatus according to Claim 25, further comprising a plurality of optical elements each having at least one aperture, wherein a straight line connecting apertures of adjacent optical elements is not contained in any of planes including optical axes of the adjacent optical elements, respectively.

28. An apparatus according to Claim 25, further comprising a plurality of optical elements each having at least one aperture, wherein apertures of adjacent optical elements are disposed at rotational positions, about an optical axis of said optical system, with angles other than zero degree and 180 degrees.

29. An apparatus according to Claim 25, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

30. An apparatus according to Claim 25, wherein said optical system includes plural optical elements each having plural apertures.

31. An exposure apparatus comprising:
an optical system having at least one optical element and including a supporting portion for supporting said at least one optical element, said supporting portion having a plurality of apertures through which a gas can flow.

32. An apparatus according to Claim 31, further comprising a plurality of optical elements each having a plurality of apertures, wherein a straight line connecting apertures of adjacent optical elements is not parallel to any of optical axes of the adjacent optical elements and the straight line also does not intersect any of the optical axes of the adjacent optical elements.

33. An apparatus according to Claim 31, further comprising a plurality of optical elements each having a plurality of apertures, wherein a straight line connecting apertures of adjacent optical elements is not contained in any of planes including optical axes of the adjacent optical elements, respectively.

34. An apparatus according to Claim 31, further comprising a plurality of optical elements each having at least one aperture, wherein apertures of adjacent optical elements are disposed at rotational positions, about an optical axis of said optical system, with angles other than zero degree and 180 degrees.

35. An apparatus according to Claim 31, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

36. An exposure apparatus comprising:

an optical system having a plurality of spaces separated by a plurality of separating portions each including an optical element and a supporting portion for supporting the optical element, wherein each of two adjacent separating portions of the plurality of separating portions has an aperture through which a gas can be transmitted, and wherein apertures of the adjacent two separating portions are disposed at rotational positions, about an optical axis of said optical system, with angles other than zero degree and 180 degrees.

37. An apparatus according to Claim 36, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

38. An exposure apparatus comprising:

an optical system having a plurality of spaces separated by a plurality of separating portions each including an optical element and a supporting portion for supporting the optical element, wherein each of two adjacent separating portions of the plurality of separating portions has an aperture through which a gas can be transmitted, and wherein a straight line connecting apertures of the adjacent two separating portions is not parallel to any of optical axes of optical elements of said adjacent two separating portions and the straight line also does not intersect any of the optical axes of the optical elements of the adjacent two separating portions.

39. An apparatus according to Claim 38, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

40. An exposure apparatus comprising:
an optical system having a plurality of spaces separated by a plurality of separating portions each including an optical element and a supporting portion for supporting the optical element, wherein each of two adjacent separating portions of the plurality of separating portions has an aperture through which a gas can be transmitted, and wherein a straight line connecting apertures of the adjacent two separating portions is not contained in any of planes including optical axes of the optical elements of the adjacent two separating portions.

41. An apparatus according to Claim 40, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

42. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 25;
and
etching the exposed substrate.

43. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 31;
and
etching the exposed substrate.

44. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 36;
and
etching the exposed substrate.

45. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 38;
and
etching the exposed substrate.

46. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 40;
and
etching the exposed substrate.

-- 47. (New) An exposure apparatus, comprising:

an optical system for directing light to an object to be exposed, said optical system including a transparent first optical element having at least one aperture; and supplying means for supplying a gas to one of a space at a light entrance side of said first optical element and a space at a light exit side of said first optical element, wherein the gas passes through the aperture.

48. (New) An apparatus according to Claim 47, further comprising a second optical element disposed in juxtaposition with said first optical element and having at least one aperture, wherein a straight line connecting the aperture of the first optical element and the aperture of the second optical element is not parallel to an optical axis of the optical system and wherein the straight line also does not intersect the optical axis of the optical system.

49. (New) An apparatus according to Claim 47, further comprising a second optical element disposed in juxtaposition with said first optical element and having at least one aperture, wherein a straight line connecting the aperture of the first optical element and the aperture of the second optical element is not contained in any planes including an optical axis of the optical system.

50. (New) An apparatus according to Claim 47, further comprising a second optical element disposed in juxtaposition with said first optical element and having at least one aperture, wherein the aperture of the first optical element and the aperture of the second

optical element are disposed at rotational positions, about an optical axis of the optical system, with angles other than zero degree and 180 degrees.

51. (New) An apparatus according to Claim 47, further comprising a second optical element having at least one aperture.

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52. (New) An exposure apparatus, comprising:

an optical system for directing light to an object to be exposed, said optical system including a first separation portion having apertures, said first separating portion separating a first space at a light entrance side of said first separating portion and a second space at a light exit side of said first separating portion, from each other; and
supplying means for supplying a gas to one of the first and second spaces, wherein the gas passes through the apertures.

53. (New) An apparatus according to Claim 52, wherein said first separating portion includes a transparent optical element and a supporting portion for supporting said optical element.

54. (New) An apparatus according to Claim 52, further comprising a second separating portion disposed in juxtaposition with said first separating portion and having plural apertures, wherein a straight line connecting one of the apertures of the first separating portion and one of the apertures of the second separating portion is not parallel

to an optical axis of the optical system, and wherein the straight line also does not intersect the optical axis of the optical system.

55. (New) An apparatus according to Claim 52, further comprising a second separating portion disposed in juxtaposition with said first separating portion and having plural apertures, wherein a straight line connecting one of the apertures of the first separating portion and one of the apertures of the second separating portion is not contained in any planes including an optical axis of the optical system.

56. (New) An apparatus according to Claim 52, further comprising a second separating portion disposed in juxtaposition with said first separating portion and having plural apertures, wherein one of the apertures of the first separating portion and one of the apertures of the second separating portion are disposed at rotational positions, about an optical axis of the optical system, with angles other than zero degree and 180 degrees.

57. (New) An exposure apparatus, comprising:

 a first separating portion for separating a first space and a second space from each other, said first separating portion having a first aperture;

 a second separating portion for separating the second space and a third space from each other, said second separating portion having a second aperture; and

 supplying means for supplying a gas to one of the first and third spaces;

wherein a relative rotational position of said first and second apertures about an optical axis of said exposure apparatus define an angle other than zero degree and 180 degrees.

58. (New) An apparatus according to Claim 57, wherein said first separating portion includes a first transparent optical element and a first supporting portion for supporting the first transparent optical element, and wherein said second separating portion includes a second transparent optical element and a second supporting position for supporting said second transparent optical element.

59. (New) An exposure apparatus, comprising:
an optical system for directing light to an object to be exposed; and
supplying means for supplying a gas to one of a first space and a third space;
wherein said optical system includes (i) a first separating portion for separating the first space and a second space from each other, said first separating portion having a first aperture, and (ii) a second separating portion for separating the second space and the third space from each other, said second separating portion having a second aperture; and
wherein a straight line connecting the first aperture and the second aperture is not parallel to an optical axis of said optical system and also does not intersect the optical system.

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60. (New) An apparatus according to Claim 59, wherein said first separating portion includes a first transparent optical element and a first supporting portion for supporting the first transparent optical element, and wherein said second separating portion includes a second transparent optical element and a second supporting portion for supporting the second transparent optical element.

61. (New) An exposure apparatus, comprising:

an optical system for directing light to an object to be exposed; and

supplying means for supplying a gas to one of a first space and a third space;

wherein said optical system includes (i) a first separating portion for separating the first space and a second space from each other, said first separating portion having a first aperture, and (ii) a second separating portion for separating the second space and the third space from each other, said second separation portion having a second aperture; and

wherein a straight line connecting the first aperture and the second aperture is not contained in any planes containing an optical axis of said optical system.

62. (New) An apparatus according to Claim 61, wherein said first separating portion includes a first transparent optical element and a first supporting portion for supporting the first transparent optical element, and wherein said second separating portion includes a second transparent optical element and a second supporting portion for supporting said second transparent optical element.

63. (New) A device manufacturing method, comprising the steps of:
performing an exposure process on a substrate by use of an exposure apparatus
as recited in claim 47; and
performing an etching process to the exposed substrate.

64. (New) A device manufacturing method, comprising the steps of:
performing an exposure process on a substrate by use of an exposure apparatus
as recited in claim 52; and
performing an etching process to the exposed substrate.

65. (New) A device manufacturing method, comprising the steps of:
performing an exposure process on a substrate by use of an exposure apparatus
as recited in claim 57; and
performing an etching process to the exposed substrate.

66. (New) A device manufacturing method, comprising the steps of:
performing an exposure process on a substrate by use of an exposure apparatus
as recited in claim 59; and
performing an etching process to the exposed substrate.